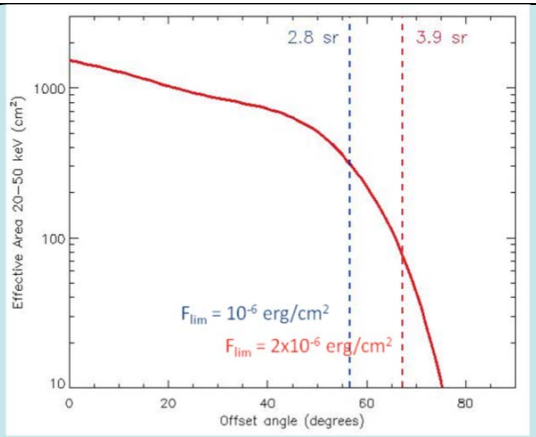
XENIA: Transient Event Detector

The *Transient Event Detector (TED)* will monitor a ~3 sr solid angle and will localize GRBs with a fluence greater than 10^{-6} erg cm^{-2} (15-150 keV), with a positional uncertainty < 4'. It will locate a sufficient number (> 50/year) of GRBs with afterglows bright enough for the HARI and CRIS instruments to determine the absorption from the WHIM and to measure the cosmic history of metals at GRB sites. TED is required to have good efficiency in the 8-200 keV range. However, lowering the threshold down to the goal of 5 keV allows a factor of ~1.5-2 increase of X-ray flash (XRF) and high-z GRB detections, and this increases the number of bright afterglows useful for the WHIM and metallicity studies.



TED is a coded mask instrument based on CZT detector technology. The design has two identical coded mask telescopes, tilted by 28° with respect to the optical axis of the HARI and CRIS. This results in a sky coverage as large as 2.8sr, as is shown above. For bursts brighter than 2×10^{-6} erg cm^{-2}, the FoV is increased to 3.9sr. The sensitivity of TED is similar to the *Swift*/BAT instrument and sufficient to detect and localize about 80 bursts with a prompt fluence of > 10^{-6} erg cm^{-2} per year. With a distance to the mask of 40.5 cm and a pixel size of 2.7 mm, a location accuracy < 4' is achieved for sources with a S/N > 10. This is sufficient to trigger fast repointing and to position the source in the 6'x6' field-of-view of the high count rate section of the CRIS.

Left: Effective area of TED (2 units) vs off-axis angle with limiting burst fluences for two different FOV limits.

Top: One TED telescope as seen from its optical axis (mask is not shown). The active detection area of TED is 1790 cm^2 for one camera with respect to a source on the TED optical axis.

Right: Spectrum for a 1 mm thick 16x16 CZT pixel detector and low noise, low power ASIC readout, obtained at room temperature. The energy resolution is 5.8% at 60 keV and 3.9% at 88 keV. The low energy threshold is 8 keV (from Abbene et al., *IEEE* 2008).